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Exhibit 7

Natural Resource Damages Associated with Aesthetic and Ecosystem Injuries to Oklahoma's Illinois River System and Tenkiller Lake

Expert Report for State of Oklahoma, in Case No. 05-CV-0329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (In the United States District Court for the Northern District of Oklahoma)

Volume I

Natural Resource Damages Associated with Aesthetic and Ecosystem Injuries to Oklahoma's Illinois River System and Tenkiller Lake

Volume I

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Acronyms and Abbreviations

ACS American Community Survey

CAPI computer-assisted personal interviewing

CIS Compact Information Systems

CV contingent valuation

DOI U.S. Department of the Interior

DUs dwelling units

EPA U.S. Environmental Protection Agency

FAQs frequently asked questions

GIS geographic information system

HUs housing units

NOAA National Oceanic and Atmospheric Administration

NRDA natural resource damage assessment

OMB Office of Management and Budget

PSUs primary sampling units

USPS U.S. Postal Service

WTA willingness-to-accept WTP willingness-to-pay

Executive Summary

This document reports the results of a study commissioned by the State of Oklahoma to measure natural resource damages associated with excess phosphorus from poultry waste and other sources entering the Illinois River system and Tenkiller Lake (hereafter, the river and lake), based on injury studies developed by the State's injury experts. A team of internationally known experts in environmental economics, natural resource damage assessments, and survey methodology conducted the study over a more than two-year period. The study was undertaken within a framework of natural resource damage assessment (NRDA) as presented in the U.S. Department of the Interior's (DOI's) NRDA regulations.

Injuries to Oklahoma trust resources from this excess phosphorus have been documented in several reports by natural science experts. Natural resource damages are the monetary value placed on the changes resulting from injuries to Oklahoma trust resources of the river and lake.

In conducting the analysis reported here, the Team focused exclusively on damages from injuries that will result from past and current land applications of poultry waste and other sources. Furthermore, the Team considered only the aesthetic and ecosystem effects resulting from excess phosphorus. Negative aesthetic effects included algae-related reductions in water clarity and the presence of more algae on the bottom and along the edges of the river and lake than would otherwise have occurred. Excess phosphorus and algae have also affected, and will continue to affect, the fish and other elements of the ecosystem of the river and lake.

To estimate the monetary value of damages, the Team conducted a contingent valuation (CV) study. CV uses carefully crafted surveys to quantify economic values. Since 1963, there have been over 6,000 papers published on CV in the United States and other countries, a significant portion of which has been published in the peer reviewed economics literature. Statistical methods have been developed to estimate CV values, evaluate error bounds, and conduct sensitivity analyses. Based on the literature, guidance on conducting valid CV studies has been developed, including guidelines formulated by the NOAA Blue Ribbon Panel on Contingent Valuation. Results from CV studies have been used to inform many public decisions and to assess natural resource damages. CV is accepted in the DOI's regulations for conducting NRDAs.

The CV survey used in this study was designed and executed to meet the highest scientific standards, including the NOAA Panel's guidelines. A leading survey research firm used inperson interviews to collect the data. Analysis of the data, using well-accepted methods, tested and documented the validity of the results.

A conservative estimate of per household damages is \$184.55. There are 1,352,878 households in the study area (63 Oklahoma counties included in the survey) based on the most recent estimates. Accordingly, a conservative estimate of the damages for the injuries to Oklahoma trust resources presented in the survey is \$249,673,635 (1,352,878 multiplied by \$184.55). The 95% confidence interval for the aggregate estimate is \$224,198,942 to \$275,148,328. This estimate of damages does not include additional categories of damages such as those resulting from injuries to groundwater or human health, or any damages for the years prior to this study.

3. Development of the Survey Instruments

3.1 Introduction

Development of the questionnaire took place between October 2006 and August 2008. During that period, the Team created and refined the *base instrument*, the questionnaire that was used to estimate damages (see Appendix A.1). A second questionnaire was also developed, the *scope instrument*, which described a smaller injury (see Appendix A.2) and was used to test whether respondents' judgments were sensitive to the size of the injury.

The goals of the base instrument development process were to build and refine a questionnaire that would:

- **b** Be consistent with injuries as assessed by the natural scientists
- ▶ Be understandable to respondents
- Offer a realistic proposed solution to the injury problem
- Offer a plausible choice mechanism
- Include questions that would permit required data analysis
- **B**e perceived as neutral by respondents.

Several steps were carried out to fulfill these goals. Section 3.2 describes how the injury information was assembled. Throughout the process, focus groups were convened to test and refine the survey materials (Section 3.3). Draft versions of the questionnaires were tested in one-on-one interviews (Section 3.4). Drafts of both the base instrument and the scope instrument were pretested (Section 3.5) and two pilot tests were conducted (Section 3.6). Throughout all of these steps, the questionnaires were extensively revised to better achieve the study's goals. The scope instrument was developed as an integral part of this process (Section 3.7). And, the entire process was carried out in ways that satisfied the guidelines of the NOAA Panel (Section 3.8). The final section deals with another aspect of validity, consequentiality (i.e., whether respondents believe that their answers in a CV survey will actually affect what is done and how much they will pay).

3.2 Development of Injury Description

The Team worked closely with the state's natural scientists to ensure the injury descriptions developed for the two questionnaires were consistent with their findings. The Team also drew on expert reports written by Engel (2008a, 2008b, 2008c), Stevenson (2008a, 2008b, 2008c), Wells et al. (2008a, 2008b), Cooke and Welch (2008a, 2008b), and Fisher (2008).

3.3 Focus Groups

Table 3.1 lists specifics of focus group sessions conducted during the development process.

Table 3.1. Location, date, and number of attendees during the focus group stage of survey development

Location	Date conducted	Number of participants
Tulsa	October 26, 2006	20
Oklahoma City	March 15, 2007	17
Tulsa	April 5, 2007	22
Tulsa	April 18, 2007	18
Tulsa	April 19, 2007	20
Oklahoma City	May 9, 2007	19
Lawton	May 10, 2007	15
Oklahoma City	May 11, 2007	19
Tulsa	May 23, 2007	17
Tahlequah	May 24, 2007	20
Tulsa	November 6, 2007	20
Tulsa	November 7, 2007	20
Oklahoma City	December 12, 2007	15
Oklahoma City	December 13, 2007	18
Tulsa	May 19, 2008	30
Tulsa	May 20, 2008	28
Tulsa	June 2, 2008	32
Tulsa	June 3, 2008	46
Tulsa	July 17, 2008	22
Oklahoma City	July 18, 2008	23

Oklahoma firms that specialize in support services for focus groups recruited participants by telephone. A screener interview was conducted during the calls to achieve a balance in the socioeconomic characteristics of participants. Most of the group sessions were held in rooms equipped with a large table, chairs, easels/flip charts, and a separate observation room with a one-way mirror. In smaller communities that lacked focus group facilities, hotel meeting rooms were used, and closed-circuit video equipment allowed observers to monitor the proceedings.

Team members (Chapman and Bishop) moderated the focus groups, while groups of other team members observed all focus groups, either in person or by listening in by telephone. Early groups entailed relatively free flowing discussions to explore people's thinking about the issues and the language they would use to talk about them. Early drafts of the questionnaires were read aloud to the participants to simulate what would happen during face-to-face interviews.

Much of the focus group session centered on refining the details of the evolving questionnaires. The issues included:

- Describing the problem in terms that subjects could understand and identifying a solution that would be plausible to respondents. The plausibility of the solution that was ultimately proposed required that respondents understand a process by which future spreading of poultry waste would be banned, so some focus group time was also spent on this issue.
- Selection of photographs used to describe the injuries. Focus group participants were asked to describe their perceptions of photographs to assure they conveyed suitable information and were understandable to respondents.
- Concerns that were raised about potential unintended consequences of the alum treatments, which led to development of text to address this issue.
- Developing language to address the extent to which respondents thought that the poultry industry should pay for the cleanup, without suppressing revealed WTP by the respondents in ways that would not be indicative of their true WTP.

The focus group participants often mentioned that they had visited the Illinois River system and Tenkiller Lake, that their personal experience and conversations with others revealed that water quality there had deteriorated over the years, that they were reluctant to engage in wading, swimming, or boating, or have their children do so because of perceptions of low water quality, that poultry waste might be causing problems there, and that poultry farms in Oklahoma and Arkansas might be involved.

3.4 One-on-One Interviews

One-on-one interviews were conducted using cognitive interviewing techniques (Willis, 2004). Procedures for recruiting participants were the same as those used to recruit focus group participants. The purpose of these interviews was to evaluate how well the questionnaires would work in circumstances similar to those during the main study's face-to-face interview conducted in respondents' homes, to further probe people's understanding of the materials, to see how long the interviews would last, and to identify any issues requiring attention in the questionnaires.

Table 3.2 shows the location, date, and number of attendees at all of the one-on-one interviews.

Table 3.2. Location, date, and number of attendees during the cognitive interview stage of survey development

Location	Date conducted	Number of participants
Tulsa	December 19, 2007	10
Tulsa	January 9, 2008	14
Tulsa	January 10, 2008	12
Enid	January 24, 2008	18

The interviews were conducted in hotel rooms by members of the Team. The process involved reading the interview script and showing the participants the visual aids that would be used. The interviewer stopped from time to time to ask the participant what he or she was thinking, probe reactions to materials, and ask respondents to restate what was just communicated in his or her own words. Participants were asked to think aloud as they answered many of the survey questions.

3.5 Pretesting

The questionnaires were pretested in a hotel setting in Oklahoma City on four occasions. Participants were recruited for the hotel pretests in the same way as for the focus groups. Up to 50 people were recruited for each session. The sessions were held in large rooms with rows of tables and chairs facing the front, where a podium, projector, and projection screen were set up. By running four sessions per night with two concurrent sessions going at a time, up to 192 participants were interviewed in one evening.

The sessions were led by members of the Team and by Stratus Consulting employees. The leader read the questionnaire and used the projector to present the visual aids on the screen for all participants to see. Participants wrote their answers to questions on a form that was provided. Participants voted by writing on a paper ballot that listed the cost of the program, which varied across participants. Table 3.3 describes the locations, dates, and number of participants in the hotel pretests.

Table 3.3. Locations, dates, and numbers of attendees during the hotel pretests

Location	Date conducted	Number of participants
Oklahoma City	January 14, 2008	80
Oklahoma City	February 4, 2008	115
Oklahoma City	February 6, 2008	192
Oklahoma City	July 31, 2008	191

These initial pretests served multiple purposes. The hotel pretests provided the Team with a large sample size for assessing the base instrument In addition, the hotel pretests allowed preliminary comparisons between the draft versions of the base and scope instruments.

3.6 Stage 4. Pilot Testing

The focus groups, one-on-one interviews, and hotel pretests yielded base and scope instruments that could then be tested in the field under more typical survey conditions.

3.6.1 Introduction

Westat, the survey contractor, implemented two pilot field studies. The first pilot test took place in April 2008, and the second took place in July 2008. For both pilots, Westat used its normal procedures to recruit, train, and supervise the interviewers. For each pilot test, Westat selected 15 segments (individual census blocks or groups of nearby blocks) purposively, to include a combination of urban and rural areas and to avoid any areas that were selected for the main study. Purposive sampling is a form of non-probability sampling in which the sample is selected to meet some particular purpose or objective. In this case, the sample was selected to give an urban-rural mix and to avoid areas selected for the main study sample. Because of the short field period for the two pilots (15 and 17 days, respectively, for the first and second pilots), Westat did not conduct numerous callbacks to households. And although the interviewers initially randomly selected a household member to serve as the respondent, they were allowed to interview an alternative eligible household member if the randomly selected person was unavailable.

Table 3.4 describes basic features for each pilot study.

Table 3.4. Features of Pilot Studies I and II

Pilot	Field period	Number of completed main interviews
I	4/7/2008-4/23/2008	152
II	7/12/2008-7/30/2008	153

3.6.2 Pilot I

The first pilot test was done to assess the performance of the base instrument, including the computer-assisted personal interviewing (CAPI) programming, show cards, and maps under realistic field conditions. In addition, the first pilot yielded an initial indication of the quality of the address lists for Oklahoma. Of the 15 sample segments used, five were in rural areas and the remaining 10 were in urban areas. A systematic sample of 30 addresses was selected in each sample segment, with a target sample size of ten completed interviews per segment, to yield about 150 completed interviews in total.

Interviewer training for the field test was done in Tulsa between April 1 and April 4, 2008. Data collection began immediately afterwards and was completed by April 23. A total of 152 respondents completed the base interview during the pilot test. Interviewers completed screeners at each sample household, and the CAPI program was used to randomly select an eligible household member. Field supervisors completed "validation" interviews with a random subsample of the respondents. Validation interviews were done to confirm with the respondent that the interviewer actually carried out the main interview.

Debriefings with the interviewers revealed that the pilot instrument had worked well and the respondents paid attention to, and were interested in, the material provided. The interviewers offered some suggestions for improving the questionnaire, the functioning of the CAPI program, and the design of the show cards. Based on analysis of the data, the Team made a number of changes to the instrument.

The Team also evaluated the performance of the address lists purchased from Compact Information Systems. The ultimate source for most of the addresses on the purchased lists is the U.S. Postal Service's Delivery Sequence File. In ten of the segments, the list of addresses appeared to give accurate coverage of the residences (e.g., they included as many or more addresses as the 2000 census had found). As expected, in the rural areas, the address list did not appear to be useful as a sampling frame, so Westat ultimately carried out a field listing in rural areas. This consisted of field staff canvassing the sample area and listing all the housing units within the area. Typically, listers noted the addresses of the housing units, but, if there is no street address (as is common in rural areas), they wrote down a description of the unit instead.

3.6.3 **Pilot II**

The purpose of the second pilot was to provide a final test of the base instrument. As with the first pilot, the sample consisted of 15 purposively selected segments (individual or adjacent census blocks that had not been selected for the main survey sample). Six of the segments had to be field listed, and the remaining nine had acceptable addresses. Thirty addresses were selected (using systematic sampling) in each sample segment, with a target sample size of ten completed interviews per segment, again to yield about 150 total interviews.

Interviewer training for the field test was done in Oklahoma City, Oklahoma, from July 8 through July 11, 2008. Data collection began immediately afterwards and was completed by July 30. A total of 153 respondents completed the main interview in the second pilot. As in the first pilot, interviewers first attempted to complete a screening interview at each sample dwelling, and the CAPI application was used to randomly select an eligible member for the base interview. Interviewers were again permitted to interview another eligible household member if

the randomly chosen respondent was unavailable. Again, validation interviews were done by the supervisors with a random subsample of the respondents to the base interview.

The questionnaire worked well in the second pilot test. The interviewers indicated that respondents were interested in the questionnaire and paid attention to the material it presented.

The second pilot confirmed earlier information about the quality of the purchased address lists. In nine of the segments, the address list purchased from Compact Information Systems (CIS) proved to be suitable as a sampling frame for the selection of dwelling units; in the remainder, enumerators needed to carry out a field listing to serve as the frame for the next stage of sampling.

3.7 Development of the Scope Instrument

The scope instrument was a modification of the base instrument. The major difference was a change in the description of what the alum treatments would do. In the base instrument, without alum treatments, the river and lake would return to 1960 conditions in 50 and 60 years, respectively. With alum treatments, these time intervals were reduced to 10 and 20 years, respectively. The scope questionnaire said that alum treatments were not needed for the river, which would return to 1960 conditions in about 10 years on its own, simply as the result of the ban of future spreading of poultry waste. The scope instrument also said that alum treatments for the lake would be much less effective and would return it to 1960 conditions in about 50 years.

These changes in the scenario necessitated several other changes in the base instrument to create a scope instrument that was consistent with it. Except for necessary changes, the base and scope instruments were identical. The base instrument and the scope instrument are compared in detail in the next chapter. The base and scope instrument appear in Appendices A.1 and A.2.

4. Structure and Content of the Final Base and Scope Instruments

4.1 Introduction

This chapter presents the part-by-part wording of the base and scope questionnaires. All the quoted text presented in this chapter is the actual text used in the base questionnaire, except when the base text differs from the scope text. In those instances, the scope text is provided in italics below the base text. The complete base and scope instruments, including show cards and maps, are provided in Appendices A.1 and A.2.

The survey instrument has nine parts. The first six parts describe the injuries, their causes, how long it will take the river and lake to recover with and without the alum treatment program, how the program would work, and the voting exercise. Parts 7 through 9 include followup and debriefing questions about the survey material. The rest of this chapter provides an overview of basic interviewer training instructions and reviews each survey part in detail.

4.2 Survey Part 1. Introduction

The first part of the questionnaire introduced the topic of water in Oklahoma. It included introductory questions and ended with a description of the baseline conditions. Sections 4.2.1 and 4.2.2 of this chapter provide the context for asking the introductory questions and presenting the baseline conditions. The discussion below explains the content and purpose of each subpart of the questionnaire, and each explanation is followed by a display of the actual wording used in that subpart.

4.2.1 Introductory questions

The questionnaire contained two sets of introductory questions. Both sets of questions encouraged respondents to think about a wide range of policy issues. They also reminded respondents that cleaning up Oklahoma rivers and lakes is just one of many policy issues the state faces.

The first set of questions (Q1-Q6) asked how important six statewide issues were to respondents personally. The six issues were improving education in public schools, reducing water pollution in Oklahoma lakes and rivers, improving local libraries, reducing crime, helping farmers increase their incomes, and reducing state income taxes. Reducing state income taxes was intended to remind respondents of the link between state programs and the amount of state taxes. Improving education in public schools, improving local libraries, and reducing crime represent important statewide issues that can be the focus of state expenditures. Reducing water pollution in Oklahoma lakes and rivers was included to gauge respondent orientations toward this issue in general. Helping farmers increase their incomes was included to illuminate attitudes toward the farming industry.

^{1.} The order in which the six items were asked was randomized, which complies with standard survey research practice.

^{2.} Highlighting taxes helps address the NOAA Panel's recommendation to deflect "warm glow" motivations (NOAA, 1993).

Q1-Q6. To begin with, I'd like to ask you about some issues in Oklahoma. Some of them may be important to you personally. Others may not be important to you personally.

SHOW CARD A³

First, how important to you is (**READ X'd ITEM**)? Not important at all, slightly important, moderately important, very important, or extremely important?

The second set of introductory questions (Q7-Q12) asked respondents whether they thought the state spends too much or too little money on various environmental and non-environmental programs. These programs included (again presented in an order randomized for each respondent) building new state prisons, repairing roads, salaries for professors at state universities, healthcare for children, cleaning up pollution, and state parks.

Q7-Q12. The State of Oklahoma spends tax money on many programs for many different purposes. I'm going to read you a list of some of these programs. For each one, please tell me whether you think the State should spend more money on this, less money on it, or about what is being spent now.

First, (ITEM).

[**IF MORE/LESS**]: A lot more/less or a little more/less?

4.2.2 Description of baseline conditions

After Q12, respondents were told that the interviewer would give them information about a program and that the state wanted to hear their opinions about whether to start this new program, which would require taxpayer money.

These are just a few of the things the State of Oklahoma spends tax money on.

Sometimes, the State considers starting a new program. The State does not want to start a new program unless people are willing to pay for it. One way for the State to find out about this is to give people like you information about a program, so you can make up your own mind about it.

^{3.} We used capital letters in the questionnaire to instruct interviewers not to read those words to the respondent. Instructions such as "(**SHOW CARD A**)" prompt the interviewer to display a card to the respondent.

To eliminate any perceived encouragement to endorse or reject the program, interviewers told respondents that different people have different views about the program.

Some people think the program they are asked about is not needed. (STOP) Others think it is. We want to get the opinions of all kinds of people.

Following this statement, interviewers asked respondents:

Q13. Before today, had you ever been interviewed like this to get your opinion about whether the State should or should not spend tax money for a particular purpose?⁴

Respondents then learned about the general topic of the survey.

In the past, people have been asked about various types of programs. The particular program I am going to ask you about involves water in Oklahoma.

Next, interviewers told respondents what to expect for the remainder of the interview. Respondents learned they would be asked to vote "for" or "against" a particular program and that they would be asked to explain their vote. This advance notice was provided to encourage thoughtful consideration of the decision.

I'll begin by telling you about a situation, and I will tell you how it came about. Then I'll ask you to vote for or against something the state could do to deal with the situation. I will also ask you to tell me why you feel the way you do. Your vote today will help the state decide what to do and may affect your taxes.

Interviewers were trained to read the material slowly so that all respondents could easily understand it. Interviewers explained this rationale to respondents and encouraged them to interrupt if they missed anything or if the material was read too quickly. Interviewers asked respondents to think carefully about each question.

I'll read this information to you slowly to make it easy for you to understand it and think about it. If I go too fast or if you'd like me to repeat something, please just let me know, so I can slow down and read it again. And when I ask you questions later, it's important that you take as much time as you would like to

^{4.} Answers to this question were recorded as "yes" or "no."

think carefully about each question and give me as accurate an answer as you can.⁵ Is that ok?

Next, interviewers showed respondents a map of the main rivers and lakes in Oklahoma, highlighting the area around the Illinois River and Tenkiller Lake to help orient respondents to the study area.

⁶SHOW CARD B

This map shows the main rivers and lakes in Oklahoma. The box (**POINT**)⁷ shows an area of eastern Oklahoma that we will talk about.

Interviewers then showed respondents a map of the area around the Illinois River and Tenkiller Lake.

SHOW CARD C8

This map shows this area in greater detail (**POINT TO INSET MAP**). Here is the Illinois River. (**POINT**)

Many small creeks flow into it. (**POINT TO SMALLER CREEKS**)

Two of the largest are Flint Creek (**POINT TO FLINT CREEK**) and Barren Fork Creek. (**POINT TO BARREN FORK CREEK**)

The area of interest for this study is the portion of the Illinois River watershed within Oklahoma. To describe the area to respondents, interviewers read the following text:

From now on, when I say the river (**POINT TO "THE RIVER"**), I will mean to include the Illinois River, Flint Creek, Barren Fork Creek, and the many smaller creeks flowing into them. (**POINT TO BIG CIRCLE LABELED "RIVER"**)

^{5.} Inducing accountability at the start of the interview promotes optimal respondent effort (Tetlock, 1983).

^{6.} The stop sign symbol instructed interviewers to pause before continuing.

^{7.} This instruction reminded interviewers to point to the specific feature on the map.

^{8.} This map showed the area around the Illinois River and Tenkiller Lake that respondents learned about. The map displayed a portion of Arkansas, which was printed in lighter colors than the portion in Oklahoma. This was done to draw attention to the Oklahoma portion, because the survey focused on the portion of the Illinois River watershed within Oklahoma, not in Arkansas.

Water from the river flows into Tenkiller Lake (**POINT**) and is stopped by the dam here. (POINT TO DAM AND CIRCLE AROUND THE LAKE LABELED "LAKE")

Respondents next learned more about the geography and characteristics of the river and lake.

The part of the Illinois River (**POINT**) within Oklahoma above the lake is about 60 miles long.

Tenkiller Lake is about 28 miles long. Many miles of creeks flow into the river and lake.

Near the river and lake are the city of Tahlequah (**POINT**), smaller cities, farms, ranches, and private homes.

${}^{f f w}$ UNTIL R IS FINISHED LOOKING AT CARD C

FLIP CARD TO NEXT, BLANK PAGE⁹

Interviewers then gave respondents some basic information about the river and lake and described the clarity of the water and the types of species living in the river and lake in the late 1950s and early 1960s. First, respondents learned about baseline conditions in the river.

In the late 1950s and early 1960s, the water in the river was clear most of the time, and it was easy to see rocks on the bottom.

Smallmouth bass and other fish had lived in the river for centuries. They ate small animals and insects living in the river. 10

Then, interviewers told respondents about baseline conditions in the lake.

In the lake, the water was clear enough so you could see down about 10 feet.

Many largemouth bass, smallmouth bass, and other fish were there, and they also ate small animals, insects, and plants living in the water and on the bottom. 11

^{9.} This instruction was used when an interviewer was to flip to a blank page so the respondent would stay focused on the oral presentation rather than the visuals.

^{10.} Stevenson (2008a, p. 44; 2008b; 2008c).

^{11.} Cooke and Welch (2008a, pp. 1-2, 34, 43, 48, and Figure 9).

Many people visited the area around the river and lake for sightseeing, fishing, canoeing, boating, and other activities.

Following the discussion about baseline conditions, respondents were asked several questions about visiting the Illinois River and Tenkiller Lake.

Q14. Have you ever visited the Illinois River or the creeks flowing into it?

Q14A. In what year did you first visit there? (PROBE¹²: What year would you like me to type?)

Q14B. In what year was your most recent visit? (PROBE: What year would you like me to type?)

Q15. Have you ever visited Tenkiller Lake?

Q15A. In what year did you first visit there? (PROBE: What year would you like me to type?)

Q15B. In what year was your most recent visit? (PROBE: What year would you like me to type?)

Answers to Q14 and Q15 were recorded "yes" and "no." If the respondent said "yes" to Q14, he/she was asked Q14A and Q14B; otherwise, the interviewer skipped to Q15. If the respondent said "yes" to Q15, he/she was asked Q15A and Q15B; otherwise, the interviewer skipped to Part 2. For questions 14A, 14B, 15A, and 15B, interviewers were instructed to record the exact word(s) used by respondents when answering the question.

^{12.} For some questions, the Team asked interviewers to probe respondents if their answers were vague or did not address the question.

4.3 **Survey Part 2. Description of the Injury**

Part 2 of the survey started with interviewers telling respondents about the scenic river status of the river.

In 1970, Oklahoma passed a law naming some rivers in the state "Scenic Rivers." The lawmakers said that these rivers possessed such unique natural scenic beauty, fish, wildlife, and outdoor recreational values that they deserve special protection for the benefit of the people of Oklahoma.

Interviewers showed respondents a map of all the rivers in Oklahoma that have been designated as scenic rivers.

SHOW CARD D

This map shows all the rivers in Oklahoma that have been officially named Scenic Rivers.

Flint Creek (POINT TO FLINT CREEK ON CARD D),

the Illinois River (**POINT TO ILLINOIS RIVER ON CARD D**),

and Barren Fork Creek (POINT TO BARREN FORK CREEK ON CARD D)

were all named "scenic rivers" by the State.

The lawmakers also named three other rivers as "scenic rivers:"

Little Lee Creek, (**POINT**),

Lee Creek (**POINT**),

and Upper Mountain Fork River (**POINT**).

UNTIL R IS FINISHED LOOKING AT CARD D

FLIP CARD TO NEXT, BLANK PAGE

Interviewers then asked respondents the following question:

Q16. Before today, did you know that the Illinois River had been named a Scenic River?¹³

At this point, the interviewer began to tell the respondent how the river and lake have changed.

During the years since around 1960, people have continued to visit the river and lake, but the river and lake have changed a lot over the last 50 years.

Interviewers used visual displays to help respondents think about how the river looked in around 1960 and how it looks now. Respondents learned about the river first.

SHOW R CARD E

Here are two pictures that show you how the river has changed.

On the left is a picture showing what the river looks like when the water is clear and there is little algae. (**POINT TO PICTURE ON LEFT**). This is just meant to give you an idea of what the river usually looked like in around 1960.

The picture on the right shows another part of the river recently with algae in it (**POINT TO PICTURE ON RIGHT**). This kind of algae grows along the edges and on the rocks at the bottom of the river. This amount of algae is most often seen between March and June. During the rest of the year there is usually a lot less. Algae can grow in water that stands still and in water that is flowing, as shown in the picture. ¹⁴

WE UNTIL R IS FINISHED LOOKING AT CARD E

SHOW R CARD F

Here are a couple of recent pictures of the river showing closer views of rocks on the bottom.

(**POINT TO PICTURE ON LEFT**) The picture on the left shows a close view of the river's bottom with little algae.

^{13.} Answers to Q16 were recorded "yes" and "no."

^{14.} Stevenson (2008a, p. 21-22; 2008b).

(**POINT TO PICTURE ON RIGHT**) The picture on the right shows a place where algae has grown on the rocks at the bottom.

WAIT FOR R TO FINISH REVIEWING

FLIP CARD TO NEXT, BLANK PAGE

Algae also floats in the water and can make the water look murky. The water in the river used to be clear most of the time. Now, during summer, the water is sometimes murky because of algae.¹⁵

Algae on the bottom and in the water has changed the types of plants and animals that live in the river. There are now fewer of the smallmouth bass, other fish, and small plants than used to live in the river. In some places, the algae uses up most of the oxygen in the water. Low oxygen causes fish to grow more slowly. And in some places, some species have probably disappeared completely because of the algae.16

Respondents then learned how the lake has changed since around 1960. Interviewers used pictures to show how the lake has changed.

The lake has also changed. Although in around 1960, people could usually see down about 10 feet in the lake, now in the summer people can often see down less than 3 feet where the river comes in. As you move closer to the dam, there is less and less algae. Near the dam, people can still see down about 6 feet most of the time in the summer. In the winter, the water is clearer and people can usually see down about 10 feet throughout the lake.¹⁷

SHOW R CARD G

Here are some pictures that show how the lake has changed.

(**POINT TO PICTURE ON LEFT**) On the left is a recent picture to give you an idea of how the lake used to look most of the time in around 1960.

^{15.} Stevenson (2008a, pp. 21-22).

^{16.} Stevenson (2008a, pp. 27, 34-36, 38-41).

^{17.} Cooke and Welch (2008a, Figure 9).

(POINT TO PICTURE ON RIGHT) The picture on the right shows how the lake sometimes looks these days, because the water is murky from algae.

UNTIL R IS FINISHED LOOKING AT CARD G

FLIP CARD TO NEXT, BLANK PAGE

In the shallow areas around the edge of the lake, the bottom is often covered with algae between spring and fall.¹⁸

In many parts of the lake where the oxygen and temperature were ideal for smallmouth bass and other types of fish people catch, there is now so little oxygen during the summer that these areas are no longer ideal for these fish. Under such conditions, smallmouth bass and the other types of fish grow slower and there are fewer of them. 19

In large areas on the bottom of Tenkiller Lake, there are a lot fewer insects and small animals than are in lakes with less algae.²⁰

Some other types of fish, such as largemouth bass, have increased in numbers and are growing more quickly.²¹

Following all the information about current conditions in the river and lake, interviewers asked respondents the following question:

Q17. Before today, had you heard anything about the changes in the river or lake that I just described?

Answers to Q17 were recorded "yes" and "no." If respondents answered "yes," they were asked this question:

Q17A. What had you heard?

^{18.} Cooke and Welch (2008a, pp. 2, 29-33).

^{19.} Cooke and Welch (2008a, pp. 3, 8-9, 37-41, and elsewhere).

^{20.} Cooke and Welch (2008a, pp. 4, 44, 50).

^{21.} Cooke and Welsh (2008a, pp. 40, 43).

If respondents said "yes" to either Q14 or Q15, interviewers asked the following question:

Q18. Have you personally seen any of these changes in the river or lake, or have you not seen any of these changes?

Answers for Q18 were recorded as "yes, I have seen these changes" and "no, I have not seen them." If the respondent said "yes, I have seen these changes," he/she was asked this question:

Q18A. What changes have you seen?

Interviewers then showed respondents a card summarizing the information presented previously in Part 2.

SHOW CARD H

This card shows what I just told you.

(**POINT TO ROW 1**) Around 1960, the water was usually clear, and now, during the summer, it is sometimes murky from algae.

(**POINT TO ROW 2**) Around 1960, there was little algae on the bottom of the river and now, between March and June, there is more algae.

(**POINT TO ROW 3**) Around 1960, there was little algae around the edges of the lake, and now, during the summer, there is more algae.

(**POINT TO ROW 4**) Around 1960, species that live most easily in water with little algae were common and now they are less common.

(**POINT TO ROW 5**) Around 1960, there was plenty of oxygen in the water. Now, in large parts of the river and lake, there is not enough oxygen, so some fish grow slower and there are fewer of them.

UNTIL R IS FINISHED REVIEWING CARD H

FLIP CARD TO NEXT, BLANK PAGE

To adhere with the NOAA Panel's recommendations (NOAA, 1993), several different checks on respondent understanding and acceptance of the scenario were implemented throughout the questionnaire. One type of question, exemplified by Q19 below, gave the respondent the opportunity to ask that a part of the narrative be read to him/her again.

Q19. Is there anything I have told you about the river or lake that you would like me to repeat?

Answers were recorded "yes" or "no." When respondents answered "no," the interviewer skipped to Part 3. Respondents who said "yes," they would like something repeated, were asked the following question:

Q19A. What is that?

Interviewers recorded respondents' comments verbatim.

4.4 Survey Part 3. Causes of the Injury

Part 3 of the survey described the causes of injury to the river and lake. First, respondents learned who investigated the injury and then the causes of changes in the river and lake were described.

Many scientists have studied why these changes have taken place in the Illinois River and Tenkiller Lake.

Some of these scientists work for the State of Oklahoma; others work at Oklahoma universities, other universities, and research organizations.

They agree that the river and lake have been changing gradually because of human activities.

Some of the changes were caused by the increasing number of chickens and turkeys being grown in the area around the river and lake. About 140 million chickens and turkeys are now raised each year near the river in Oklahoma and Arkansas. This produces more than 300 thousand tons of what is called "poultry litter" each year. Poultry litter is chicken and turkey droppings mixed with wood shavings and other things put on the floors of poultry houses.²²

For many years, the people growing chickens and turkeys have collected the poultry litter and spread it on nearby land. Most of this land is used to grow grass for cattle and other animals. The litter contains phosphorus and nitrogen, which help grass to grow. But now, there is much more phosphorus than the grass can use. Rain washes some of this excess phosphorus into the river and lake. Once there, this phosphorus acts as a fertilizer to help more algae to grow on rocks and in the water.²³

Scientists have measured how much phosphorus comes into the river and lake from different sources. They have found that about 60% of the phosphorus in the river and lake is from chickens and turkeys. The other 40% comes from sewage treatment plants, fertilizers bought in stores, and other sources.²⁴

^{22.} Fisher (2008, pp. 19, 22-24, 34-35).

^{23.} Fisher (2008, pp. 25-30).

^{24.} Engel (2008a, p. 93).

Phosphorus in the river and lake is what's causing more algae to grow, to coat rocks, and to make the water murky. This affects the fish, other animals, insects, and small plants in the ways I described earlier.

Part 3 concluded with a question about respondents' prior knowledge about the sources of the excess phosphorus.

Q20. Before today, had you heard anything about why there is now more phosphorus in the river and lake than in around 1960?

Answers were recorded as "yes" or "no." If the respondent said "no," the interviewer skipped to Part 4. If the respondent said "yes," he/she was asked the following question:

Q20A. What had you heard?

Interviewers recorded respondents' answers verbatim.

4.5 Survey Part 4. Recovery Program

In Part 4, respondents learned about the state's proposed actions to reduce phosphorus in the river and lake.

SHOW CARD I

Many of the other rivers and lakes in Oklahoma do not have excess algae. These are shown in blue on this map (**POINT TO BLUE AREAS**). These include the other Scenic Rivers: Little Lee Creek, Lee Creek, and Upper Mountain Fork River (**POINT TO OTHER SCENIC RIVERS**).

Some rivers and lakes do have excess algae. These are shown in yellow on this map (**POINT TO YELLOW AREAS**). ²⁵ The excess algae has caused changes in those places like the changes that have happened in the Illinois River and Tenkiller Lake. In nearby states, there are also some water bodies that have excess algae, and some water bodies that are clear.

The excess algae in the rivers and lakes shown in yellow on the map is caused by phosphorus coming from various sources, and the state of Oklahoma is taking actions to reduce the amount of new phosphorus that goes into these rivers and lakes from these other sources.

For example, sewage treatment plants are being improved. And State environmental agencies will enforce new rules so that other fertilizers do less harm.

FLIP CARD TO NEXT, BLANK PAGE

The state is doing additional things to reduce phosphorus in the Illinois River, Flint Creek, and Barren Fork Creek, because Oklahoma law requires that these Scenic Rivers be kept clean. Tenkiller Lake is also a very popular place for people to visit and for recreation, so the State is putting extra effort into reducing phosphorus there as well.

The state has asked a federal court to stop all future spreading of poultry litter on land around the river and lake. The court is expected to make a decision about the

^{25.} The Team generated the yellow areas on this map by using a geographic information system (GIS) layer provided by The Oklahoma Water Resources Board.

ban by the end of the year. The ban would immediately stop spreading in both Oklahoma and Arkansas.

At this point in the questionnaire, the base and scope instruments begin to diverge. For parts where the text is different, we show the base text first followed by "BASE:" and the scope text second in italics following "SCOPE:"

BASE:

The ban and the other things being done will greatly reduce the amount of new phosphorus put onto land and in the river and lake in the future, but a lot of phosphorus that was spread on the land in the past will remain there. For many years, it will continue to wash into the river and lake when it rains.

SCOPE:

The ban and the other things being done will greatly reduce the amount of new phosphorus put onto land and in the river and lake in the future. The excess phosphorus will quickly wash out of the river, but much of the phosphorus that's in the lake now will remain there.

Respondents then learned that alum treatment of the river and lake could reduce the excess phosphorus faster. Interviewers told respondents they would have to decide whether to vote "for" or "against" the alum treatment program.

BASE:

The purpose of this interview is to find out whether you think the State should or should not do something else as well. The excess phosphorus could be removed by putting alum on the land and in the water. I will tell you about what alum is and how it could be used to remove the excess phosphorus in a moment.

After I tell you about the situation, I will ask you to vote on whether the state should or should not put alum on the land and in the water in order to return the river and lake to around 1960 conditions faster. Your vote will help state officials to decide whether to carry out the alum treatments.

SCOPE:

The purpose of this interview is to find out whether you think the State should or should not do something else in the lake. The excess phosphorus in the lake could

be removed by putting alum in the water. I will tell you about what alum is and how it could be used to remove the excess phosphorus in the lake in a moment.

After I tell you about the situation, I will ask you to vote on whether the state should or should not put alum in the lake in order to return the lake to around 1960 conditions somewhat faster. Your vote will help state officials to decide whether to carry out the alum treatments.

The next question asked respondents about their prior knowledge about alum. Answers were recorded as "yes" or "no."

Q21. Before today, had you ever heard of alum?

Interviewers told respondents more about alum and its uses. Additionally, respondents learned that alum does not harm humans and that humans have been using alum for many years. The paragraphs below demonstrate how the information was presented.

Alum is a naturally occurring mineral. Deposits of it are in the ground in many places around the world.

Alum is safe for humans.

SHOW CARD J

Alum is in many products that people use, including food. For example, alum is used to keep pickles crisp, and you can buy alum powder at the grocery store for many uses, including cooking and making "play dough" for children.

WAIT UNTIL R IS FINISHED REVIEWING CARD J

FLIP CARD TO NEXT, BLANK PAGE

Also, water treatment plants in the U.S. and other countries have used alum to clean drinking water for more than 80 years.

An important component of the alum story is how alum neutralizes phosphorus in the river and lake. The following narrative was used to describe this process.

BASE:

When alum is put into river or lake water that contains phosphorus, the alum attaches to the phosphorus to form harmless particles that fall to the bottom and

blend into the dirt there. So if alum were put into the river and lake, the phosphorus there could no longer help algae to grow and there would then be a lot less algae in the water.

If alum is put on land, it attaches to phosphorus in the soil to form harmless particles. When these particles wash into rivers and lakes, the particles sink to the bottom and do not help algae to grow.

So to reduce algae in the river and lake, alum could be spread on the land and on the water.

SCOPE:

When alum is put into lake water that contains phosphorus, the alum attaches to the phosphorus to form harmless particles that fall to the bottom and blend into the dirt there. So if alum were put into the lake, the phosphorus there could no longer help algae to grow and there would then be a lot less algae in the water.

Alum treatments will not be needed for the river. The natural flow of water in the river will remove the excess phosphorus there. After the ban is in place, the river will naturally return to what it was like in around 1960 in 10 years. Phosphorus will remain in the lake much longer because the lake is large and the water moves through it very slowly.

Interviewers told respondents that the Army Corps of Engineers would work with the Oklahoma Department of Environmental Quality to spread alum.

BASE:

Here's how the alum treatments could be done.

The Army Corps of Engineers operates the lake, and they would work with the Oklahoma Department of Environmental Quality to spread the alum.

Crews of people would be hired and trained to use trucks to put alum on the land.

Specially designed boats would spread alum on the lake.

Alum would also remove phosphorus from river water flowing into Oklahoma from Arkansas. Dispensers would be put near the border to spread alum on the water when sensors find lots of phosphorus in it.

Here's how the alum treatments would be done.

The Army Corps of Engineers operates the lake, and they would work with the Oklahoma Department of Environmental Quality to spread the alum.

Specially designed boats would spread alum on the lake.

The questionnaire described past experience with using alum and discussed its negative impacts.

BASE:

For more than 35 years, alum has been used successfully and safely to remove phosphorus and reduce algae in many states, such as Colorado, Texas, Missouri, South Dakota, Florida, Wisconsin, and Washington. Those states had some rivers and lakes with lots of algae like the Illinois River and Tenkiller Lake. Experiences in those states have convinced scientists that alum does not harm fish or other things living in water, and that alum treatments here in Oklahoma could safely return the river and lake to what they were like in around 1960.

Putting alum on the land and in the water would have some undesirable effects. The alum would be a white powder on the land surface until rains carry it down into the soil. After alum is put into the river and lake, it would make the water cloudy for a few hours until it settles to the bottom. And if anyone were to drink the lake water in the first hour, it might taste bitter.

Alum treatments would be needed for 5 years to remove all the excess phosphorus now on the land and in the water.

SCOPE:

For more than 35 years, alum has been used successfully and safely to remove phosphorus and reduce algae in lakes in many states, including Colorado, Texas, Missouri, South Dakota, Florida, Wisconsin, and Washington. Those states had some lakes with lots of algae like Tenkiller Lake. Experiences in those states have convinced scientists that alum does not harm fish or other things living in lakes, and that alum treatments here in Oklahoma could safely return the lake to what it was like in around 1960.

Putting alum in the lake would have some undesirable effects. After alum is put into the lake, it would make the water cloudy for a few hours until it settles to the bottom. And if anyone were to drink the lake water in the first hour, it might taste bitter.

Alum treatments would be needed for 5 years to remove all the excess phosphorus in the lake.

Next, respondents were shown a card summarizing the main points in Part 4.

SHOW R CARD K²⁶

This card summarizes what I just told you.

BASE:

(**POINT TO ROW 1**) A court-ordered ban would stop spreading of poultry litter near the river and lake in Oklahoma and Arkansas. This will occur even if alum treatments are not done.

(**POINT TO ROW 2**) Alum could be spread on land from trucks.

(**POINT TO ROW 3**) Alum could be spread on the lake from boats.

(**POINT TO ROW 4**) Alum could be sprayed in river water flowing into Oklahoma from Arkansas.

(**POINT TO ROW 5**) Alum treatments would need to be done for 5 years to remove all the excess phosphorus.

SCOPE:

(POINT TO ROW 1) A court-ordered ban would stop spreading of poultry litter near the river and lake in Oklahoma and Arkansas. This will occur even if alum treatments are not done.

(**POINT TO ROW 2**) Alum could be spread on the lake from boats.

(POINT TO ROW 3) Alum treatments would need to be done for 5 years to remove all the excess phosphorus from the lake.



^{26.} Card K was different for the base and scope instruments. See Appendices A.1 and A.2.

FLIP CARD TO NEXT, BLANK PAGE

Next, respondents learned how effective the alum treatments would be at reducing phosphorus in the river and lake. Interviewers showed respondents a timeline to illustrate how soon the river and lake would return to around 1960 conditions with alum treatments.

If the federal court bans spreading of litter, alum treatments could begin soon after that.

SHOW CARD L (TIMELINE 1)

BASE:

As a result of alum treatments, the river would be back to what it was like in around 1960 (**POINT TO 1960**) about 10 years from now (**POINT TO 1960**) about 20 years from now (**POINT TO 20 YEARS**). Water in the river and lake would then be clear nearly all the time, and there would be little algae in the water and on the bottom. There would then be plenty of oxygen in the water. Species of fish, insects, small animals, and small plants that used to be common would slowly increase in numbers, replacing those that live in water with lots of algae. There would be fewer of some species, such as largemouth bass.

SCOPE:

As a result of alum treatments, the lake would be back to what it was like in around 1960 (POINT TO 1960) about 50 years from now (POINT TO 50 YEARS). Water in the lake would then be clear nearly all the time, and there would be little algae in the water and on the bottom. There would then be plenty of oxygen in the water. Species of fish, insects, small animals, and small plants that used to be common would slowly increase in numbers, replacing those that live in water with lots of algae. There would be fewer of some species, such as largemouth bass.

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Alum would only do this if much less new phosphorus is put on the land and in the water in the future. So no alum would be put out until after a court bans spreading of poultry litter. Respondents were then asked about their prior knowledge about using alum to reduce algae. Answers to Q22 were recorded as "yes" or "no."

Q22. Before today, had you heard that alum could reduce algae in water?

If respondents said "yes," they were asked Q22A. Interviewers were instructed to record answers verbatim.

Q22A. What had you heard?

4.6 Survey Part 5.1. Natural Recovery

Part 5.1 described the recovery of the river and lake without the addition of alum treatments (e.g., natural recovery).

BASE:

The river and lake will go back to what they were like in around 1960 without alum, but it will take longer.

Scientists say that if spreading of poultry litter is banned, natural processes will allow the river and lake to gradually return to what they were like in around 1960, even with no alum treatments.

Rain would slowly wash the phosphorus into the river and lake for many years. Each year, a little less phosphorus would be washed into the river and lake.

Because the river flows into the lake, the phosphorus in the river would be washed into the lake and would be kept there by the dam. The phosphorus would sink to the bottom of the lake and would slowly be covered by dirt, which would eventually seal it off, so that it could not help algae to grow.

SCOPE:

Scientists say that if spreading of poultry litter is banned, natural processes will gradually return the lake to what it was like in around 1960, even with no alum treatments, but it will take somewhat longer.

The phosphorus remaining in the lake would sink to the bottom and would slowly be covered by dirt, which would eventually seal it off, so that it could not help algae to grow.

Interviewers showed respondents Timeline 2, which diagramed the difference between natural recovery and recovery using alum treatments.

SHOW CARD M (TIMELINE 2)

BASE:

Without alum treatments, it will take about 50 years²⁷ (**POINT**) for the river to get back to what it was like in around 1960 (**POINT TO 1960**) instead of about 10 years (**POINT**). That is about 40 years longer. It will take the lake about 60 years²⁸ (**POINT**) to get back to what it was like in around 1960 (**POINT TO 1960**) instead of about 20 years (**POINT**). That is also about 40 years longer.

SCOPE:

Without alum treatments, it will take the lake about 60 years (**POINT**) to get back to what it was like in around 1960 (**POINT TO 1960**) instead of about 50 years (**POINT**). That is about 10 years longer.

W UNTIL R IS FINISHED REVIEWING CARD M

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Part 5.1 concluded with another question to gauge respondent understanding of the scenario. Responses to this question were coded "yes" and "no."

Q23. Would you like me to repeat anything that I just told you?

If respondents answered, "no" to Q23, the interviewer skipped to Part 6. If respondents answered "yes" to Q23, they were asked Q23A. Interviewers recorded answers verbatim and then reread the requested portions of text.

Q23A What would you like me to repeat?

^{27.} Engel (2008a, p. 1; 2008b, p. 11).

^{28.} Cooke and Welch (2008a, p. 49; 2008b).

4.7 Survey Part 6. Description of Vote and the Voting Questions

Part 6 started by informing the respondent the poultry industry would have to pay the cost to safely dispose of any litter they produce from now on. Interviewers next told respondents that Oklahoma taxpayers would have to pay for the alum treatments. Interviewers told respondents that because some farms have gone out of business and because other Oklahomans contributed to the excess phosphorus the poultry industry would not pay for alum treatments. ²⁹

BASE:

If a court bans spreading of poultry litter, the industry will have to safely get rid of all the litter they produce from now on. The industry will have to pay for this, and the river and lake will naturally return to what they were like in around 1960. If the people of Oklahoma want this to happen 40 years sooner, there will be an additional cost for the alum treatments. Oklahoma taxpayers will have to pay some of this cost because many chicken and turkey farms have gone out of business over the years. In addition, many other Oklahomans contributed to the excess phosphorus through sewage and their use of fertilizer.

We are interviewing people in Oklahoma to ask them to vote on whether the state should or should not put alum on the land and in the water. Your vote today will affect whether or not alum treatments are done.

SCOPE:

If a court bans spreading of poultry litter, the industry will have to safely get rid of all the litter they produce from now on. The industry will have to pay for this. The river will naturally return to what it was like in around 1960 in 10 years, and the lake will naturally return to what it was like in around 1960 in 60 years. If the people of Oklahoma want the lake to return to what it was like in around 1960 in 50 years rather than 60 years, there will be an additional cost for the alum treatments. Oklahoma taxpayers will have to pay some of this cost because many chicken and turkey farms have gone out of business over the years. In addition, many other Oklahomans contributed to the excess phosphorus in the lake through sewage and their use of fertilizer.

^{29.} The NOAA Panel recommended that the survey be designed to deflect the "dislike of big business" (NOAA, 1993).

Next, respondents learned about the payment vehicle: the Oklahoma state income tax. Oklahomans would pay a one-time tax, which would be in addition to what the respondent already paid in state income taxes.

BASE:

The state does not want to start the program unless it has all the funds needed to buy the equipment, hire and train the staff, and complete the 5 years of alum treatments. To pay for this, Oklahoma taxpayers would pay a one-time tax added to their state income tax bill next year. The cost to your household would be \$(BIDAMNT). The money would go into a special trust fund that can be used only for alum treatments. This is the only payment that would be required.

SCOPE:

The state does not want to start the program unless it has all the funds needed to buy the equipment, hire and train the staff, and complete the 5 years of alum treatments to the lake. To pay for this, Oklahoma taxpayers would pay a one-time tax added to their state income tax bill next year The cost to your household would be \$_(BIDAMNT). The money would go into a special trust fund that can be used only for alum treatments. This is the only payment that would be required.

Interviewers reiterated that the alum treatments would work only if the state bans harmful spreading of poultry waste.

Because alum would work only after spreading of new poultry litter is stopped, there would be no alum treatments and no new tax unless the court bans spreading of litter.

Just before respondents were asked to vote, interviewers summarized the issues in voting.

BASE:

Voting for the program means (**PAUSE**) that it is worth it to you (**PAUSE**) for your household to pay the additional one-time tax of \$ (**BIDAMT**) (**PAUSE**) to return the Illinois River, Flint Creek, Barren Fork Creek, the smaller creeks flowing into them, and Tenkiller Lake to what they were like in around 1960 40 years sooner.

Voting for the program means (PAUSE) that it is worth it to you (PAUSE) for your household to pay the additional one-time tax of \$ (BIDAMT) (PAUSE) to return Tenkiller Lake to what it was like in around 1960 in 50 years rather than 60 years.

Interviewers showed respondents a card listing reasons to vote "against" the program. The first reason to vote "against" reemphasized that many rivers and lakes in Oklahoma do not have excess algae.

On the other hand, there are reasons why you might vote against the alum treatments. For instance, you might think alum treatments are a bad idea. And, even if you think alum treatments are a good idea, you might vote against them because:



(**POINT**) Many rivers and lakes in Oklahoma do not have excess algae.



A second reason to vote "against" is that other rivers and lakes in Oklahoma with excess algae would not be affected by these alum treatments.

(POINT) The other rivers and lakes in Oklahoma that do have excess algae would not be affected by these alum treatments.

A third reason to vote "against" is that the river and lake will recover over time without alum treatments.

BASE:

(**POINT**) Natural processes will return the river and lake to what they were like in around 1960 in 50 to 60 years without alum treatments.

SCOPE:

(POINT) Natural processes will return the lake to what it was like in around 1960 in 60 years without alum treatments.

A fourth reason to vote "against" is that there may be other issues on which they would prefer to spend tax dollars.

(**POINT**) If the state does increase your taxes, you might prefer that it spend the money on other environmental issues or on issues other than the environment.

A fifth reason to vote "against" is respondents' budget constraints.

(**POINT**) Or the tax increase might be more than your household can afford to pay.

UNTIL R IS FINISHED REVIEWING CARD N

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Immediately before respondents were asked to vote, they were reminded to consider the effectiveness of the program, its cost, and other things they could spend money on instead.

In a moment, I'm going to ask you to vote. Before you vote, please think about what the alum treatments would do, the cost that your household would have to pay, and the other things you could spend the money on instead.

Next, interviewers explained what it meant to vote "for" or "against" the alum treatment program.

Voting "for" the alum treatments means that you want them to be done beginning next year if a court bans future spreading of poultry litter by December of this year.

Voting "against" the alum treatments means that you do not want them to be done.

The first voting question, W1, asked respondents to make a decision to vote "for" or "against" the alum treatments given a specified cost to their household.

W1. Now please tell me whether you vote for or against the alum treatments, which would cost your household a one time additional tax of \$ (**BIDAMT**).

When an interviewee gave an initial response such as "don't know," "not sure," or "would not vote," interviewers were instructed to encourage them to vote "for" or "against" the proposal. If respondents insisted that they would or could not vote, interviewers were instructed to accept this as a valid answer and to record the vote as "not sure."

Respondents who voted against the program were asked to explain the reasons for their vote.

Respondents who were recorded as responding "not sure" were asked why they were unsure.

W2. Could you tell me why you aren't sure? (**BE SURE TO PROBE**)

Respondents who voted for the alum treatments were asked why they voted for the program.

W3. What would spreading alum do that made you vote for it? (*PROBE*: "Can you be more specific about what you have in mind?" / "Anything else?" / "What would spreading alum do that made you vote for it?")

Interviewers were instructed to use the appropriate probes for responses such as "It's a good thing."

4.8 Survey Part 7. Debriefing Questions

Part 7 contained debriefing questions, which documented some of the things that respondents were thinking when they voted and gauged their level of certainty about their vote.

4.8.1 Perception of injury, program, and interview

Respondents were asked Q24 if they voted "for" or "against" the alum treatments in W1. If respondents said they were "not sure" how they wanted to vote, the interviewer skipped to Q25. Interviewers showed respondents Card O, which listed a set of answer options and asked:

SHOW CARD O

Q24. How sure are you that you want to vote (**FOR/AGAINST**) the alum treatments? Not sure at all, slightly sure, moderately sure, very sure, or extremely sure?

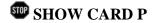
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In the next sequence of questions, respondents were asked to report what they had in mind or had assumed when they voted. The answers to these types of questions provided another check on respondent understanding and acceptance of the scenario (NOAA, 1993).

This sequence of questions was introduced with the following statement:

Now I would like to ask you some questions about what you were thinking when you decided how to vote.

Interviewers then showed respondents Card P, which listed the response options for Q25 and Q26 (not serious at all, slightly serious, moderately serious, very serious, and extremely serious) and asked about perceived seriousness.



BASE:

Q25. After spreading of litter is banned, how serious did you think the effects of algae in the river would be if no alum treatments are done? Not serious at all, slightly serious, moderately serious, very serious, or extremely serious?

- **Q25**. After spreading of litter is banned, how serious did you think the effects of algae in the river would be? Not serious at all, slightly serious, moderately serious, very serious, or extremely serious?
- **Q26.** After spreading of litter is banned, how serious did you think the effects of algae in the lake would be if no alum treatments are done? Not serious at all, slightly serious, moderately serious, very serious, or extremely serious?

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The next question gauged whether respondents believed that alum treatments would be done only if a court bans harmful spreading of poultry waste.

Q27. When you decided how to vote, did you think that alum treatments would be done only if a court bans spreading of litter, or did you think that the alum treatments might be done anyway?

Respondents were then asked whether they thought that phosphorous had caused the changes to the river and lake the interviewer told them about.

Q28. When you decided how to vote, did you think that phosphorus had caused the changes in the river and lake I told you about, or did you think that phosphorus had not caused those changes?

Next, respondents were asked how quickly they thought the river would recover naturally after poultry waste is banned. This question was asked only in the base version.

Q29. When you decided how to vote, did you think that it would take about 50 years for the river to get back to around 1960 conditions without alum treatments, or did you think it might take less time or more time?

A similar question was asked about natural recovery for the lake.

BASE:

Q30. Now let's turn to the lake. I told you it would take about 60 years for the lake to return to what it was like in around 1960 without alum treatments. When you decided how to vote, did you think that it would take about 60 years, or did you think it would take less time or more time?

Q30. I told you it would take about 60 years for the lake to return to what it was like in around 1960 without alum treatments. When you decided how to vote, did you think that it would take about 60 years, or did you think it would take less time or more time?

The next few questions (Q31-Q34) examined respondents' beliefs about the effectiveness of the program and the payment period.

SHOW CARD Q³⁰

BASE:

Q31. When you decided how to vote, how well did you think that alum treatments would work at reducing algae in the water? Not well at all, slightly well, moderately well, very well, or extremely well?

SCOPE:

Q31. When you decided how to vote, how well did you think that alum treatments would work at reducing algae in the lake? Not well at all, slightly well, moderately well, very well, or extremely well?

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Q32. When you decided how to vote, did you think that if the alum treatments are done, your household would have to pay the amount I told you, more than that amount, or less than that amount?

BASE:

Q33. When you decided how to vote, did you think that the extra tax money would be used for alum treatments to reduce algae in only Tenkiller Lake and the Illinois River and creeks flowing into it, or did you think some of this money would be used clean up other rivers and lakes in Oklahoma as well?

^{30.} Card Q listed the response options for Q31: not well at all, slightly well, moderately well, very well, and extremely well. See Appendices A.1 and A.2.

Q33. When you decided how to vote, did you think that the extra tax money would be used for alum treatments to reduce algae only in Tenkiller Lake, or did you think some of this money would be used to clean up other lakes in Oklahoma as well?

BASE:

Q34. When you decided how to vote, did you think that if the alum treatments are done successfully for the Illinois River and Tenkiller Lake, this would or would not increase the chances that other rivers and lakes in Oklahoma would get alum treatments later?

SCOPE:

Q34. When you decided how to vote, did you think that if the alum treatments are done successfully for Tenkiller Lake, this would or would not increase the chances that other lakes in Oklahoma would get alum treatments later?

4.8.2 Trust, payment mechanism preferences, and respondent recreational activities

The next two questions (Q35-Q36) asked respondents about their trust in university scientists and the state government.

SHOW CARD R³¹

Q35. In general, how much do you believe what university scientists say? Not at all, a little, a moderate amount, a lot, or a great deal?

Q36. In general, how much do you believe what the people who run Oklahoma state government say? Not at all, a little, a moderate amount, a lot, or a great deal?

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The next question asked respondents whether they preferred to pay for new programs through higher taxes or through higher prices.

^{31.} Card R listed response options for Q35 and Q36: Not at all, a little, a moderate amount, a lot, or a great deal. See Appendices A.1 and A.2.

Q37. There are different ways for people to pay for new programs to protect the environment. (PAUSE) One way is for the government to pay the cost. This will raise everyone's taxes. (PAUSE) The other way is for businesses to pay the cost. This will make prices go up for everyone.

If you had to choose, would you prefer to pay for new environmental programs through higher income taxes or through higher prices?

The next three questions asked respondents about their recreational activities.

- Q38. During the last 12 months, how many times have you gone to any river or lake for sightseeing, fishing, boating, swimming, or any other type of recreation?
- Q39. During the last 12 months, have you taken a trip away from home to observe birds or wildlife?
- **Q40.** During a typical month, how many times do you watch television programs or read about wild animals or birds?

The final question in Part 7 asked respondents to report the degree to which they thought of themselves as an "environmentalist."

SHOW CARD S

Q41. Would you say you think of yourself not an environmentalist at all, slightly an environmentalist, a moderate environmentalist, a strong environmentalist, or a very strong environmentalist?

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4.9 Survey Part 8. Demographic Characteristics

4.9.1 Respondent household experience and demographic characteristics

Part 8 began by asking respondents questions about their household and personal characteristics.

Now, I have just a few questions about your background.

- **Q42**. First, in total, how many years have you lived in Oklahoma?
- **Q43**. Do you intend to move outside of Oklahoma in the next year?
- **Q44**. In what month and year were you born?

Next, respondents were asked about their education. Interviewers coded responses into one of 16 categories, ranging from "no schooling completed" to "doctoral degree."

Q45. What is the highest degree or level of school you have completed?

MARK ONE BOX. IF CURRENTLY ENROLLED, MARK THE PREVIOUS GRADE OF HIGHEST DEGREE RECEIVED.

Next, respondents were asked about other personal characteristics.

- **Q46.** Do you have children or stepchildren of any age, including anyone who lives outside your household?
- **Q47**. Do you have any grandchildren?
- **Q48.** Did anyone in your household pay Oklahoma state income taxes in 2007, either by having taxes withheld from your income or by sending money to the State with a tax form, or did no one in your household pay taxes last year?
- **Q49.** When you filed your state tax return for 2007, did you get a refund of all the money that you paid in before that?
- **Q50**. What language do you usually speak at home?
- **Q51.** Are you Spanish, Hispanic, or Latino?

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Card P listed the response options for the race question. Respondents could choose one or more of the following: white, black or African American, American Indian or Alaska native, Asian, Native Hawaiian or other Pacific Islanders, or "other."

SHOW CARD T

Q52. Please choose one or more of the races shown here that you consider yourself to be.

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Respondents were asked to report their total family income in 2007. The question defined what respondents should include in their estimate, such as income from social security and profits from business or farms. The question also defined what was meant by "family." If respondents refused to provide a value, interviewers were instructed to go through a sequence of questions attempting to assign the respondent to an income category.

Q53. My next question is about your family income. This includes income from jobs, pensions, social security, interest, child support, dividends, profits from businesses or farms, or any other sources of income.

If you live alone, your family income is just your total income. If you live with other family members, your family income includes your total income plus the incomes of any of the family members who live with you.

During 2007, what was your total family income before taxes?

4.9.2 Payment difficulty and reassessment questions

The next question asked respondents how difficult it would be for their household to pay the amount of money mentioned in the vote question. The response options for this question were extremely difficult, very difficult, moderately difficult, slightly difficult, or not difficult at all.

SHOW CARD U

Q54. How difficult would it be for your household to actually pay the additional tax of \$(BIDAMT)? Would it be extremely difficult, very difficult, moderately difficult, slightly difficult, or not difficult at all?

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Respondents who voted "for" the alum treatment program were asked to review their response to the vote question and were offered the opportunity to change their vote.

Q55. Now that you've had time to think a bit more about the situation, I'd like to give you a chance to change your answer to the voting question if you like. Here is the question one more time:

Now please tell me whether you vote for or against the alum treatments, which would cost your household a one time additional tax of \$ (BIDAMT).

Q55A. Why is that?

Next, respondents were asked whether they felt pushed to vote one way or the other by the presentation of information. People who felt pushed were asked two follow-up questions (Q56A and Q56B), probing in which direction they felt pushed and why they felt this way.

Q56. Thinking about all the information I gave you, overall, did it try to push you to vote one way or the other, or did it let you make up your own mind about which way to vote?

Q56A. Which way did it try to push you to vote?

Q56B. Please tell me what made you think that it tried to push you to vote one way or the other. (PROBE: "Can you be more specific about what you have in mind?" "Anything else?")

4.9.3 Other questions

The final question for respondents, Q57, asked for some basic contact information. Westat asks this standard question in surveys of this type for validation.

Q57. In case my supervisor wants to confirm that we had this conversation, could you please tell me your full name and the best phone number to reach you at? (RECORD FULL NAME AND PHONE NUMBER ON RECORD OF ACTIONS. DO NOT RECORD IT HERE.)

At the end of each interview, interviewers answered some evaluation questions. Question D1 asked the interviewer to record the respondent's sex. Questions D2 through D9 asked for the interviewers' thoughts about the interview situation, how attentive (or distracted) the respondent was during the interview, and about any difficulties the respondent may have had.

- **D1**. What is Respondent's SEX
- **D2**. How distracted was the respondent?³²
- **D3**. How attentive was the respondent?
- **D4**. How well did the respondent understand the material?
- **D5**. Did the respondent say anything suggesting that he or she had any difficulty understanding what you told him or her?
- **D5A**. Describe the difficulties.
- **D6**. Did the respondent have any difficulty understanding the vote questions?
- **D6A**. Describe the difficulties.
- **D7**. How impatient was the respondent?³³
- **D8.** How seriously did the respondent think about the decision about how to vote?³⁴
- **D9**. Not counting you and the respondent, was anyone age 13 or older present when the respondent voted?

The final evaluation question encouraged interviewers to record any additional comments they had about the interview.

D10. Do you have any other comments about this interview?

^{32.} Response options for D2, D3, and D4 were extremely, very, moderately, slightly, and not at all.

^{33.} Response options were extremely impatient, very impatient, moderately impatient, slightly impatient, and not impatient at all.

^{34.} Response options were extremely seriously, very seriously, moderately seriously, slightly seriously, and not at all seriously.

References

Cooke, G.D. and E.B. Welch. 2008a. *Eutrophication of Tenkiller Reservoir, Oklahoma and Effects on Water Quality and Fisheries*. Expert Report, State of Oklahoma in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Cooke, G.D. and E.B. Welch. 2008b. 2nd Errata for: Eutrophication of Tenkiller Reservoir: Oklahoma and Effects on Water Quality and Fisheries. Expert Report, State of Oklahoma in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Engel, B. 2008a. *Poultry Waste Generation and Land Application in the Illinois River Watershed and Phosphorus Loads to the Illinois River Watershed Streams and Rivers and Lake Tenkiller*. Expert Report for the State of Oklahoma in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Engel, B. 2008b. Errata for Poultry Waste Generation and Land Application in the Illinois River Watershed and Phosphorus Loads to the Illinois River Watershed Streams and Rivers and Lake Tenkiller. Expert Report for the State of Oklahoma in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma). September 4.

Fisher, J.B. 2008. In the matter of State of Oklahoma, ex rel., A. Drew Edmondson in his capacity as Attorney General of the State of Oklahoma, and Oklahoma Secretary of the Environment, C. Miles Tolbert, in his capacity as the Trustee for Natural Resources for the State of Oklahoma, Plaintiffs, v. Tyson Foods, et al. CASE NO. 05-CV-329-GFK-SAJ, in the United States District Court for the Northern District of Oklahoma.

NOAA. 1993. Natural Resource Damage Assessment under the Oil Pollution Act of 1990. [Report of the NOAA Blue Ribbon Panel on Contingent Valuation.] *Federal Register* 58:4601-4614. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Available: http://www.darrp.noaa.gov/library/pdf/cvblue.pdf. Accessed September 22, 2008.

Stevenson, R.J. 2008a. *Nutrient Pollution of Streams in the Illinois River Watershed, Oklahoma: Effects on Water Quality, Aesthetics, and Biodiversity*. Expert Report for State of Oklahoma, in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Stevenson, R.J. 2008b. Errata for: Nutrient Pollution of Streams in the Illinois River Watershed, Oklahoma: Effects on Water Quality, Aesthetics, and Biodiversity. Expert Report for State of

Oklahoma, in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Stevenson, R.J. 2008c. Second Errata for: Nutrient Pollution of Streams in the Illinois River Watershed, Oklahoma: Effects on Water Quality, Aesthetics, and Biodiversity. Expert Report for State of Oklahoma, in Case No. 05-CU-329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (in the United States District Court for the Northern District of Oklahoma).

Tetlock, P.E. 1983. Cognitive style and political ideology. *Journal of Personality & Social Psychology* 45:118-126.

5. Implementation of the Main Study

5.1 Introduction

Westat, Inc. administered the main study, with oversight by the Team. Westat is a leading statistical survey research organization that provides services to agencies of the U.S. Government, as well as businesses, foundations, and state and local governments. Founded in 1971, Westat is the largest survey firm of its kind in the United States, with more than 1,900 employees.¹

For the main study, Westat:

- Selected a representative probability sample of Oklahoma residents (excluding a small proportion of the population residing in the sparsely-populated counties in the far western portion of the state)
- Created a list of addresses for housing units (HUs) in areas where the address list purchased from CIS [and derived from the U.S. Postal Service's (USPS') Delivery Sequence File] were deemed inadequate for sampling purposes
- Recruited and trained interviewers
- Supervised the data collection effort (conducted from September through December 2008)
- Validated that the interviews had actually been conducted
- Computed sampling weights
- Compiled the data sets (including both responses to closed-ended questions and verbatim responses to open-ended questions).

This chapter describes each of these activities in detail.

^{1.} The only firms in the country larger than Westat focus on market research.

5.2 Sample Design and Selection

Westat used standard area probability methods to select the sample. Probability (or random) sampling is the preferred method for selecting a sample because it allows for unbiased projections to the population of interest (Kish, 1967). Other methods of sampling do not guarantee that population estimates will be unbiased.

Most large government surveys, such as the Current Population Survey used to derive the monthly unemployment statistics, are based on area probability sampling (U.S. Census Bureau, 2006). With this method, samples are usually selected from geographical areas in multiple stages, starting with large areas (such as counties or metropolitan areas), and then moving to successively smaller areas (such as blocks or individual addresses). Area sampling offers three main advantages over other probability methods for selecting samples of the general population. First, because the sample is clustered, it is cost-effective. The clustering of the sample in small areas, such as blocks, reduces data collection costs and allows for a larger sample size. Second, area probability samples provide the highest level of coverage of the population. In contrast, telephone samples omit a substantial proportion of the population from the outset (e.g., households without a telephone); so in principle, area probability samples provide much more complete coverage of the population (Groves et al., 2004). Finally, the combination of area probability sampling with face-to-face interviews generally leads to the highest response rates and the most accurate reporting. For these reasons, area probability sampling is typically used when it is important that the survey provide unbiased population estimates.

Westat selected the sample for the main study in four stages, beginning with Zip Code areas in the first stage of sampling, then blocks within the sample zip codes in the second stage, individual addresses on the sample blocks in the third stage, and finally selecting individual persons within sample households in the final stage. This type of multistage design is commonly used for general population surveys in the United States.

5.2.1 Population definition

The target population for the study was the civilian adult household population of Oklahoma. Adults were defined as persons 18 years of age or older (at the time the household was screened). The household population excludes persons living in group quarter settings, such as nursing homes, prisons, barracks, college dormitories, convents, or monasteries. College students living in off-campus housing were eligible to be interviewed if they were age 18 or older.

To reduce data collection costs, some counties in the western portion of the state were dropped prior to sampling. As shown in Figure 5.1, the geographical area sampled included the entire state except for Alfalfa, Beaver, Beckham, Cimarron, Dewey, Ellis, Greer, Harmon, Harper, Major, Roger Mills, Texas, Woods, and Woodward counties. Dropping these counties from the target population removed 24% of the geographic area of the state but only about 3% of the population. This figure is based on U.S. Census Bureau estimates of county populations, as of July 1, 2006.

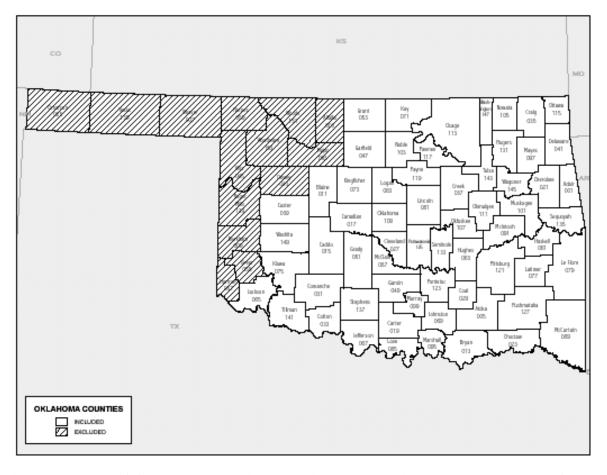


Figure 5.1. Map of Oklahoma, showing counties that were included and excluded from the survey.

5.2.2 First stage of sample selection

In sampling terminology, the largest units in a multistage area probability sample are called "primary sampling units," or PSUs. In this study, each of the PSUs consisted of the set of Census blocks linked to a single USPS Zip Code. Initial geocoding of Census blocks had produced a total of 518 PSUs, but 21 of these were very small, containing fewer than 100 housing units (HUs), according to Census 2000 data (more recent population figures were not available at the block level). Small units are inconvenient for sampling purposes (since the sample design may require more selections than the unit includes) so these 21 small PSUs were combined with nearby Zip Codes with similar characteristics, resulting in 497 initial PSUs, each with at least 100 HUs.

According to Census 2000 data, these 497 PSUs encompassed a total of 1,461,465 HUs. Since the desired sample size was 90 PSUs, each representing 1/90th of the population (or about 16,250 HUs), any of the 497 PSUs that contained at least 14,000 HUs in the target population were included in the sample with certainty (that is, with probability 1.0). Westat used this slightly lower cutoff (14,000 HUs) to ensure that borderline large PSUs were included in the sample. This step in the selection process yielded 12 certainty selections. The selection of certainty PSUs helps ensure proportionate representation to the most populous areas in the state.

To select the other 78 sample PSUs, Westat first grouped the remained 485 "noncertainty" PSUs into 39 sampling strata to ensure the representativeness of the sample. The PSUs were first placed into four regional groupings, based on county. Within each region, the PSUs were further classified by their level of urbanicity (the percent of HUs in the PSU that were in urban areas) and percent minority (based on the percent of Hispanic and non-Hispanic, nonwhite persons in the PSU). Westat made an effort to form strata with approximately equal numbers of HUs. Finally, two PSUs were drawn from each of the 39 noncertainty strata, with probabilities proportional to the number of HUs. Table 5.1 shows the number of HUs (according to 2000 Census figures), number of strata, and the total number of noncertainty PSUs in each region.

^{2.} Region 1 included Caddo, Carter, Comanche, Cotton, Custer, Garvin, Grady, Jackson, Jefferson, Kiowa, Love, McClain, Murray, Stephens, Tillman, and Washita counties. Region 2 included Blaine, Canadian, Cleveland, Garfield, Grant, Kay, Kingfisher, Logan, and Oklahoma counties. Region 3 included Adair, Cherokee, Craig, Creek, Delaware, Kay, Lincoln, Mayes, McIntosh, Muskogee, Noble, Nowata, Okfuskee, Okmulgee, Osage, Ottawa, Pawnee, Payne, Pottawatomie, Rogers, Sequoyah, Tulsa, Wagoner, and Washington counties. Region 4 included Atoka, Bryan, Choctaw, Coal, Haskell, Hughes, Johnston Latimer, LeFlore, Marshall, McCurtain, Pittsburg, Pontotoc, Pushmataha, and Seminole counties.

Table 5.1. Noncertainty PSU frame

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Region	Number of HUs	Number of strata	Number of PSUs		
1	164,579	5	108		
2	387,973	12	103		
3	550,818	17	170		
4	162,081	5	104		
Total	1,265,451	39	485		

5.2.3 Second stage of sample selection

Zip Code areas are too large for data collection purposes. To reduce data collection costs, most surveys select clusters of housing units selected from the same second stage units, or "segments" that typically consist of one or more Census blocks. For each of the sample PSUs, Westat defined a set of segments using block-level data from Census 2000. Each block had a measure of size that reflected either the number of HUs in the segment (according to the 2000 census) or the number of addresses (according to the USPS address lists). Westat obtained the address lists for the sample PSUs from CIS, the same vendor who provided the address lists for the pilot studies. Each address was geocoded to determine the Census blocks on which they belong. In total, 713,012 addresses were purchased for the Zip Codes associated with the 90 sample PSUs and 640,880 of these could be assigned to a Census block. (Most of the remaining addresses were Post Office box numbers.)

Westat created block records that included the Census HU count, the number of USPS addresses geocoded into the block, and block identifying information. Each block record was assigned the larger of either the Census HU count or the number of USPS addresses as its measure of size. To avoid selecting areas with few housing units, Westat imposed a minimum size requirement on the segments (as it had with the PSUs). Blocks with a measure of size of less than 30 were combined with nearby blocks to form segments that met the minimum requirement of 30 HUs.

Westat selected the second-stage sample by first sorting the list of segments by PSU and then sorting within PSU, by the segment measure of size (which was the sum of the size measures for all the blocks in the segment). A sample of 420 segments was drawn from the list with probabilities proportional to the segment measure of size. Probability proportional to size sampling is often used in surveys, because it has the intuitive appeal of giving larger areas greater chance of selection than smaller areas, but yields close to an equal probability sample at the household level.

Segments were classified into two groups based on the ratio of the number of addresses geocoded into the segment to the number of HUs reported in the 2000 Census. Segments for which this ratio exceeded 75% were designated "address list" segments (there were 282 of these), and the remaining 138 sample segments were designated as "field listed" segments. The address list was deemed adequate for sampling purposes in the first group of segments, but not for segments in the second group. In the field listed group, a lister would be assigned to compile a list of the HUs in the segment.

5.2.4 Third stage of sample selection

Within the address list segments, addresses were sampled directly from the list of USPS addresses that had been geocoded to that segment. Westat selected ten addresses in each of the address list segments, resulting in a total sample of 2,820 addresses.

For the field listed segments, Westat field staff canvassed the segment to create a list of the HUs within the segment. These lists were then used to select a sample of eight to 20 addresses. One segment slated for field listing did not contain any HUs, but only a temporary campground. Two other segments designated for field listing were inside gated communities and field staff could not gain entry to list the HUs. From the remaining field listed segments, 1,386 HUs were selected. Westat compared the addresses from the field listed segments with the list of purchased addresses. In some instances, the same addresses were found on the address lists for segments designated as address list segments. When this occurred, Westat deleted the duplicate from the field list sample to avoid giving these HUs two chances of selection (one in the address list segment and another in the field list segment). A total of 99 cases were deleted during this process, leaving an initial sample for the field listed segments of 1,287 HUs.

At the conclusion of the third stage, the initial sample included 4,107 HUs (2,820 from the address list segments and 1,287 from the segments that were field listed). Subsequently, 87 HUs were added as a result of the quality control procedures described in the next section giving a total of 4,194 HUs. The purpose of these quality assurance procedures was to correct for any omissions from either the address lists or the field listings.

5.2.5 Checking the lists of addresses

No list of addresses is perfect (in part because new housing units are always being built). As a result, most area probability surveys incorporate quality control procedures for capturing units that were omitted from the address list. Westat minimized the chances of missing HUs in field listed segments by conducting a thorough check of the addresses listed in a random subsample of segments. Addresses that were missed or belonged to newly built units were then added to the

sample. This step eliminated any coverage bias from missed housing units in the field listed segments.

Westat used a slightly different procedure to check for missing units in the address segments (see Table 5.2). Under the modified procedure, field staff prepared a list of addresses for any HUs in the selected segment that were not included in the USPS-derived address list for the segment. However, as Dohrmann et al. (2006) pointed out, some of the "missed" units found in this way may not actually be missed but may simply have been assigned to the wrong area due to geocoding errors. For this reason, Westat compared any new addresses found in the address segments with the lists of USPS addresses in neighboring segments. If the "missed" unit appeared in the list of addresses for another address segment, it was not added to the sample because such units already had a chance of being selected in the segment to which they had been geocoded.

Table 5.2. Quality control procedures for missed units

Type of segment	Number of sample segments	Number of addresses in initial sample	Number added in QC procedures	Total number of sample addresses
Address	282	2,820	79	2,899
Field listed	138	1,287	8	1,295
Total	420	4,107	87	4,194

In both types of segments, additional checks were made for missed units in a randomly selected subsample of apartment buildings. Finally, at all the sampled addresses, interviewers attempted to identify separate living quarters (such as basement apartments) that would not otherwise have been listed in either the address or field listed segments.

Implementing these quality control procedures across both types of segments added a total of 87 HUs to the sample.

Finally, Westat compared the selections with addresses of certain persons employed by or under contract to the defendants to the lawsuit. These addresses were not to be included in the sample. None of the addresses matched and no selections were removed.

5.2.6 Subsampling at the third stage of selection

In mid-October, it became apparent that more HUs had been selected for the base interview than were needed to meet the sample size target. To reduce the number of samples, Westat selected a random subsample of the cases that were still pending (approximately 3,000); completed cases, known ineligibles, and final refusals were excluded from the subsampling process. At total 931 randomly selected cases were dropped from the sample at this point. The remaining 3,263 sample HUs were retained in the final screening sample.

5.2.7 Final stage of sample selection

In the final stage of sampling, a roster of eligible adults living in each sampled HU was obtained during a screening interview. To be eligible for the base or scope interview, a member of the household had to be 18 years of age or older and living at the dwelling at the time of screening. Once the screener had been completed the household was randomly assigned to get the main or scope instrument and was also randomly assigned a bid amount.

The screening program also randomly selected one of the eligible adults in each HU to complete the base or scope interview. Screening interviews were completed at 1,793 of the 3,263 sample households.

5.2.8 Weights

Survey data may be weighted for several reasons. First, the sample members often have different selection probabilities. For example, the design for the main study called for the selection of a single respondent from each sample household. This gives a higher selection probability to persons who live by themselves, so that they are overrepresented in the sample relative to the population. Weighting compensates for this overrepresentation by assigning more weight to persons selected that had lower probabilities of selection. Weighting is also used to compensate for differences in response rates across different subgroups of the sample. Differential nonresponse can mean that the composition of the sample of *respondents* by subgroup differs systematically from the composition of the population. Finally, weights are often assigned to compensate for chance differences between the sample and the population of interest. The weights applied in the main study were calculated in three steps. The first two steps were designed to adjust for differential selection probabilities and for differential nonresponse; the third step brought the sample into line with independent population figures for the state of Oklahoma. Three separate weights were calculated — one for all the respondents, one for those who completed the base questionnaire, and one for those who completed the scope questionnaire. Below, we describe the weighting procedures used for all respondents. Similar methods were

used to create weights for the subsamples of respondents who completed the base and scope questionnaires.

Calculation of base weights. The first step involved developing a base weight that represented the inverse of the person's selection probability. This initial weight (w_1) reflected all four stages of selection described earlier (that is, the selection of sample PSUs, segments, dwellings, and individual respondents); in addition, the initial weight took into account the subsampling procedure described in Section 5.2.6. The base weight was a product of five factors:

$$W_{1ijk} = \frac{1}{\pi_i} x \frac{1}{\pi_{1ij}} x \frac{1}{\pi_{2ij}} x \frac{1}{n_{ijk}} x \frac{1}{s_{ijk}}.$$

The first factor reflects the selection probability for PSU i (π_i); the second reflects the selection probability for segment j conditional on the selection of PSU i (π_{lij}); the third, the sampling rate for addresses within that segment (π_{2ij}); the fourth factor reflects the selection probability for an individual from household k within segment j and PSU i (and n_{ijk} represents the number of members of that household who were eligible for the survey); and the final factor reflects the subsampling probability (s_{ijk}) – that is, the probability that a unit was retained in the sample after subsampling. If the fourth factor is dropped, the initial weight becomes a household-level weight rather than a person-level weight.

Adjusting for nonresponse. The nonresponse adjustment was made in two stages. Westat first adjusted the base weights for screener nonresponse. Twelve nonresponse adjustment cells were defined by region, type of segment (urban vs. rural), and other segment-level variables derived from the Census 2000 block files. The final cells were developed using a CHAID analysis. The screener nonresponse adjustment factor (R_{DU}^{NR}) is the inverse of the weighted response rate within the adjustment cell. A similar adjustment factor (R_{SP}^{PS}) was computed to compensate for nonresponse after the screener interview had been completed. Eight adjustment cells were defined by age, sex, race/ethnicity, and selected segment-level variables. (Westat's report on the main study in Appendix C describes the nonresponse adjustments in more detail.) Again, the base and scope interview nonresponse adjustment factor was the inverse of the weighted response rate to the base and scope interview (conditional on completion of the screener interview) within the adjustment cell. For respondents, the non-response adjusted weight (w_2) was the product of the base weight and the two adjustment factors. For nonrespondents, the adjusted weight was zero.

Adjusting to population figures. We stat made a final adjustment to the weights to align the weighted sample counts to independent population counts derived from the 2007 American

Community Survey (ACS). This was done using a ratio-raking algorithm, in which the weighted sample marginal totals for certain variables were iteratively adjusted to agree with the corresponding population counts. The population marginals included ten age-sex groups and five race/ethnicity categories.

Replicate weighting. To make it possible to use replication methods for estimating the variances of statistics derived from the survey data, Westat computed replicate weights. Jackknife replicates were created by dropping one PSU from a particular stratum, and then doubling the weight of the cases in the PSU that was retained in that stratum. Starting with stratum 1, a total of 69 jackknife replicates were formed. Each jackknife replicate was weighted using the same procedures described earlier for the full sample. This resulted in a total of 70 weights for each respondent (a full-sample weight and 70 replicate weights). Separate sets of weights were developed for the base, scope, and common questionnaire items.

5.3 Interviewer Recruitment, Training, and Supervision

5.3.1 Interviewer recruitment

A Westat field supervisor oversaw the recruitment effort. A total of 42 interviewers were recruited for the study; 19 were local residents and 23 were "travelers" who were brought in from outside the state. Eight of the local interviewers had been involved in field work for one or both of the pilot studies.

5.3.2 Interviewer training

Westat and the Team conducted interviewer training in Oklahoma City, on September 17-19. The training was led by Michael Shea (the Westat Project Director) and Sherry Sanborne, who had overall responsibility for the field effort. Two members of the Team, David Chapman and Jon Krosnick, also participated in the training. The interviewers were not informed about the role of the research in the ongoing litigation.

On the first day of training the instructors:

- Introduced the study
- Described the sample design
- Provided tips for getting in the door
- Introduced the advance letter and other recruitment materials
- Gave the interviewers practice ("role plays") in administering the screening interview
- Provided training on the CAPI software (in series of "lessons" that demonstrated directed features of the software).

On the second day of training, emphasis shifted to the base questionnaire. Dr. Jon Krosnick introduced the questionnaire, and he and David Chapman read through the entire instrument twice, demonstrating the show cards and maps. The remainder of the day mostly involved "role play" by the interviewers (where they practiced administering the base questionnaire) and an associated question-and-answer session. The day concluded with a session given by Dr. Krosnick on methods for gaining cooperation from sample members.

The final day of training included:

- Additional role play exercises, in which interviewers practiced both the screener and the base interview
- Training to locate hidden housing units and complete the record of contacts and the noninterview reports
- Specifics on how to transmit the completed cases electronically
- Additional information about other administrative matters.

To maintain production, Westat conducted "attrition" training in its Rockville, MD Offices on November 11-14. This second training followed an agenda similar to the first. Dr. Krosnick again led several of the training sessions. Three interviewers were trained in November and began field work immediately afterward.

Both the initial and attrition training covered a number of key issues on the presentation of the questions. These included the use of visual aids, responses to frequently asked questions, the best method for presenting information to respondents, recording verbatim responses, and probing unclear answers.

Visual aids. When instructed to do so in the CAPI program, interviewers showed visual aids to respondents. The team created and pretested these visual aids to help respondents understand key aspects of the scenario and to maintain respondent engagement. The visual aids for both the base and scope scenarios included one flip chart ($8\frac{1}{2} \times 14$), six laminated cards (also $8\frac{1}{2} \times 14$), and a booklet with 21 show cards (maps, timelines, and picture sets). The laminated cards included four maps and two timelines and were bound by a $\frac{1}{2}$ inch ring. The interviewers used the flip chart and laminated cards if they had to sit far away from the respondent during the interview.

Frequently asked questions (FAQs). Respondents were told that the State of Oklahoma was conducting the study to get "opinions about important issues facing the state these days." If respondents asked for more information about the survey, the interviewers were instructed to use only the replies provided on a FAQ card. The FAQ card listed questions respondents might ask before, during, or after the interview and gave answers to be provided for those questions. For example, if asked, "What is this survey about?" interviewers were instructed to say "The purpose of this study is to ask people who live in Oklahoma for their opinions about important issues facing the state these days." If asked, "Why should I participate?," interviewers were instructed to say "Your answers will help the state of Oklahoma understand how the people of Oklahoma feel about problems affecting the state and what they want done to address those problems."

Presenting information. During training, interviewers learned to read the survey material in a way that would maintain respondent interest and enhance comprehension. Below is an excerpt from the interviewers' training manual that emphasized this theme:

This survey is different from many other surveys you may have worked on in the past. You will give a lot of information to respondents about the river and lake, about the condition of the water, about the fish that live in the river and lake, and about a program to reduce the effects of the phosphorus on the river and lake. You'll read this information to the respondents, and it is very important that you read the information slowly and clearly and in a neutral way, exactly as it is written. Much of the information is illustrated or summarized on show cards. The purpose of all the information is to let people make up their own minds about the program – it's important to avoid pushing people to vote for or against the program (Shea et al., 2008).

During interviewer training sessions, leaders repeatedly reminded interviewers to present the information in a neutral fashion and let respondents make up their own minds about their answers.

Recording verbatim responses. At several times during the interview, respondents were asked open-ended questions, which allowed them to answer in their own words rather than requiring they select a response from a set of offered response choices. Also, respondents sometimes offered spontaneous open-ended comments during the interviews. Westat instructed interviewers to type exactly what the respondent said, asking the respondent to pause, if necessary, so the interviewer could completely record an answer or comment. The interviewers' training manual (and the oral training session) emphasized the importance of accurately recording comments made during the interview. Interviewers practiced typing open-ended answers and comments, referred to as verbatim responses, during role-play sessions in the interviewer training.

Probing. During training sessions, interviewers learned how to use nondirective probing techniques to clarify respondent answers to open-ended (or close-ended) questions. These techniques were to be used if a respondent's answer was vague or did not adequately answer a question. Nondirective probing is a standard procedure in contemporary survey research (Groves et al., 2004). It requires the interviewer to ask the respondent to elaborate or think about an incomplete answer without influencing the content of the answer. Each interviewer received question-by-question instructions that provided probes that could be asked.

5.3.3 Supervision

Westat assigned two central office staff to oversee the interviewing effort and two additional staff to provide support on computer issues. In addition, three field supervisors were in Oklahoma and had more frequent contact with the interviewers. One of the three field supervisors was primarily responsible for the interviewers brought in from out of state (the "travelers"). The other two supervisors were responsible for the in-state interviewers, with one supervisor overseeing the interviewers in the Tulsa area and the other overseeing those in the Oklahoma City area.

The supervisory staff was tasked to promote high levels of productivity, help interviewers achieve high completion rates, and to reassign cases from one interviewer to another as needed. The field supervisors also monitored interviewer hours and expenses, and two of the supervisors also conducted interviews.

5.4 Main Study Data Collection

5.4.1 Data collection

Field work on the main study began in August, when field staff listed the 138 segments for which the addresses purchased from CIS did not appear adequate for sampling purposes. These segments were in rural areas and the addresses were mainly rural delivery route addresses. The listing operation was completed in about three weeks.

Interviewing started immediately after completion of the interviewer training on September 20 and ended on December 8. Each interviewer had an assignment consisting of 50 or more sample addresses. Interviewers worked the urban areas (Tulsa and Oklahoma City) first and then moved on to the rural segments. Field supervisors transferred cases among the interviewers as needed to maintain productivity. A second, "attrition" training was held in the second week of November to replace interviewers who had dropped out by then.

The interview consisted of two parts, a screening interview (or screener) and the base or scope interview. After verifying that they had located the sample address, the interviewers conducted the screening interview. The screening interview was administered using a computer-assisted personal interviewing (CAPI) program that gathered basic information about each adult member living in the sample housing unit. When there was more than one adult household member, the CAPI program randomly selected one of them to be the respondent for the base or scope questionnaire. The screener took five to eight minutes to complete. The base interview was then administered also via CAPI and the use of visual aids, including maps, photographs, timelines, sets of response categories, and show cards summarizing key information. The base and scope interview generally took between 30 and 60 minutes to complete.

A number of things were done to achieve a high completion rate:

- An advance letter (example text is shown in Appendix C) describing the study was sent to sample addresses prior to the interviewer's first visit;
- When no one was at home, interviewers left a "Sorry I Missed You" card (see Appendix C) with their name and telephone number;
- Central office staff obtained names and telephone numbers for 728 of the sample addresses and forwarded these to the interviewers to make it easier for them to contact sample households;
- Refusal conversion letters were sent via FedEx to households where potential respondents had expressed reluctance to take part in the study. This was done in late

October and again in early December (for cases that were contacted after the first set of refusal conversion letters were sent out).

Two members of the Team (Dr. Krosnick and Dr. Tourangeau) made refusal conversion telephone calls.

Overall, 1,793 cases completed screening interviews; an additional 378 of the sample addresses were vacant or did not exist and thus were ineligible. A total of 1,637 cases completed the base or scope interview. Section 5.4.3 provided a more detailed discussion of the response rates for the study.

As a quality control measure, field supervisors and home office staff carried out "validation" interviews to verify that the completed base or scope interviews had actually been done. The bulk of the validation interviews were done by telephone, but, when a telephone number was not provided, a face-to-face validation interview was done. The validation interviews were brief and confirmed that an interview had in fact been done, asking about the purpose and content of the interview. About 15% of each interviewer's completed cases were validated.

5.4.2 Response rate

The final sample included 3,263 addresses. Screeners were completed at 1,793 of these addresses, 378 of them were determined to be ineligible (these were mostly vacant housing units or structures that were not housing units at all), and the remainder were eligible screener nonrespondents. The unweighted response rate to the screener (that is, the proportion of the eligible households that completed a screening interview) was 62.1%. The weighted response rate (in which the weights are the base weights described in Section 5.2.8) was 58.1%.

Of the 1,793 households that completed the screener, 1,637, or 91.3%, also completed the base or scope questionnaire. (The corresponding weighted response was 89.3%). The overall response rate, taking into account nonresponse to both the screening and base and scope interviews, was 56.7% (that is, $62.1\% \times 91.3\%$); the overall weighted response rate was 51.9% ($58.1\% \times 89.3\%$).

Appendix F presents several analyses examining whether nonresponse introduced bias into the survey estimates. We found little evidence that nonresponse bias had an impact on the main study results.

5.5 Data Processing

The use of CAPI software greatly reduced the amount of back-end data processing needed to produce a final data set. Most of Westat's data cleaning effort involved correcting obvious typos and other errors in the verbatim responses. In addition, creation of the final data set also included the imputation of missing data and the coding of the open-ended responses.

Imputation refers to replacing missing values with plausible or predicted values. The missing values result from questions that respondents were unwilling or unable to answer. Imputation is useful for reducing any biases introduced into the results by item nonresponse and also for maintaining the number of cases that can be used in the multivariate analyses. Although there are several methods for imputing missing values, two methods are commonly used in surveys and give similar results — regression-based imputation and hot deck imputation (see, for example, the discussion in Little and Rubin, 2002). For this study, the Team used hot deck procedures to fill in missing values for key variables.

In hot deck imputation, cases are grouped into imputation cells based on variables that are available both for the cases with complete data and those with missing values. The cells are formed so that cases in the same cell are expected to have similar values on the variable of interest. For example, to impute missing values for annual income, researchers might use imputation cells based on the respondent's employment status, occupation, and educational attainment. Once cases have been grouped into imputation cells, a random "donor" (a case with a valid value on the variable of interest) is selected and that case's value is used as the imputed value for the case with missing data. The key variable for which the Team imputed values was income. Appendix E gives a more detailed description of the procedure used for inputting missing income values.

The base and scope interview included a number of questions where respondents were asked to formulate answers in their own words. For example, respondents were asked to explain why they had voted the way they did. The Team developed a coding scheme to permit quantitative analyses of these open-ended responses. (Appendix D.2.1 lists the verbatim responses and gives a description of the development of the coding scheme.) The coding manual (in Appendix D.2.2) gave detailed instructions to the coders for classifying these open-ended responses. Tables 6.2 and 6.3 in the next chapter show some of the results based on the coding of reasons for voting for or against the alum treatments.

A total of 12 coders carried out the coding under the supervision of Dr. Amanda Scott. The coders were experienced, and had Bachelor's or more advanced degrees, or both. Tests of intercoder agreement indicated higher than 95% agreement on the assignment of codes.

References

Dohrmann, S., D. Han, and L. Mohadjer. 2006. Residential Address Lists vs. Traditional Listing: Enumerating Households and Group Quarters. *JSM Proceedings, the ASA Section on Survey Research Methods*, pp. 2959-2964.

Groves, R.M., F.J. Fowler, M.P. Couper, J.M. Lepkowski, E. Singer, and R. Tourangeau. 2004. *Survey Methodology*. John Wiley, New York.

Kish, L. 1967. Survey Sampling. John Wiley, New York.

Little, R.J. and D.B. Rubin. 2002. *Statistical Analysis with Missing Data*. Second Edition. John Wiley, Hoboken, NJ.

Shea, M., S. Sanborne, A. Chu, J. Strenio, J. Jones, and W. Bauman. 2008. Base survey administration report: Oklahoma watershed study. Rockville, MD. December.

U.S. Census Bureau. 2006. *Design and Methodology: Current Population Survey*. Technical Paper 66. Department of Commerce, Washington, DC.

F.2 Comparison of Subgroups of Respondents

Table F.2 shows the overall percentage of votes "for" on the key WTP item for the early respondents (the 556 cases who completed the survey by October 21) and for the late respondents (the 537 cases who completed it after October 21). The table also shows the percentage of "for" votes for easy respondents (the 513 respondents who required only one or two contacts to complete the interview) and for the difficult respondents (the 580 who required three or more contacts). The figures in Table F.2 are based on the respondents who completed the base instrument. The differences between the early and late respondents are quite small (about 1%) and they are not statistically significant. Similarly, the differences between hard and easy respondents are also small and not significant.

Table F.2. Percent votes	"for"	by respondent	subgroup.
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Subgroup	Proportion "for"	F value for difference	
Early respondents	59.0%	F(1,68) < 1	
Late Respondents	57.9%		
Easy respondents	57.1%	F(1,68) < 1	
Difficult respondents	59.4%		

Additional analyses (not presented here) looked at differences by subgroups of respondents in answers to other attitudinal items in the questionnaire. For example, Question 2 asked respondents, "How important to you is reducing water pollution in Oklahoma lakes and rivers?" The answers of early and late respondents on this item did not differ significantly, nor did the answers of easy and difficult respondents.

Overall, these analyses did not reveal any consistent pattern of differences between respondents who completed the survey early or with relatively little effort from the field staff and those who completed it later or who required more effort. Willingness to pay did not differ among the subgroups of respondents, nor did the analyses reveal any systematic differences in their attitudes toward the environment.

References

Bethlehem, J. 2002. Weighting nonresponse adjustments based on auxiliary information. In *Survey Nonresponse*, R. Groves, D. Dillman, J. Eltinge, and R. Little (eds.). John Wiley, New York, pp. 275-288.

Groves, R.M. and M.P. Couper. 1998. *Nonresponse in Household Interview Surveys*. John Wiley, New York.

OMB. 2006. *Standards and Guidelines for Statistical Surveys*. Office of Management and Budget, Washington, DC.